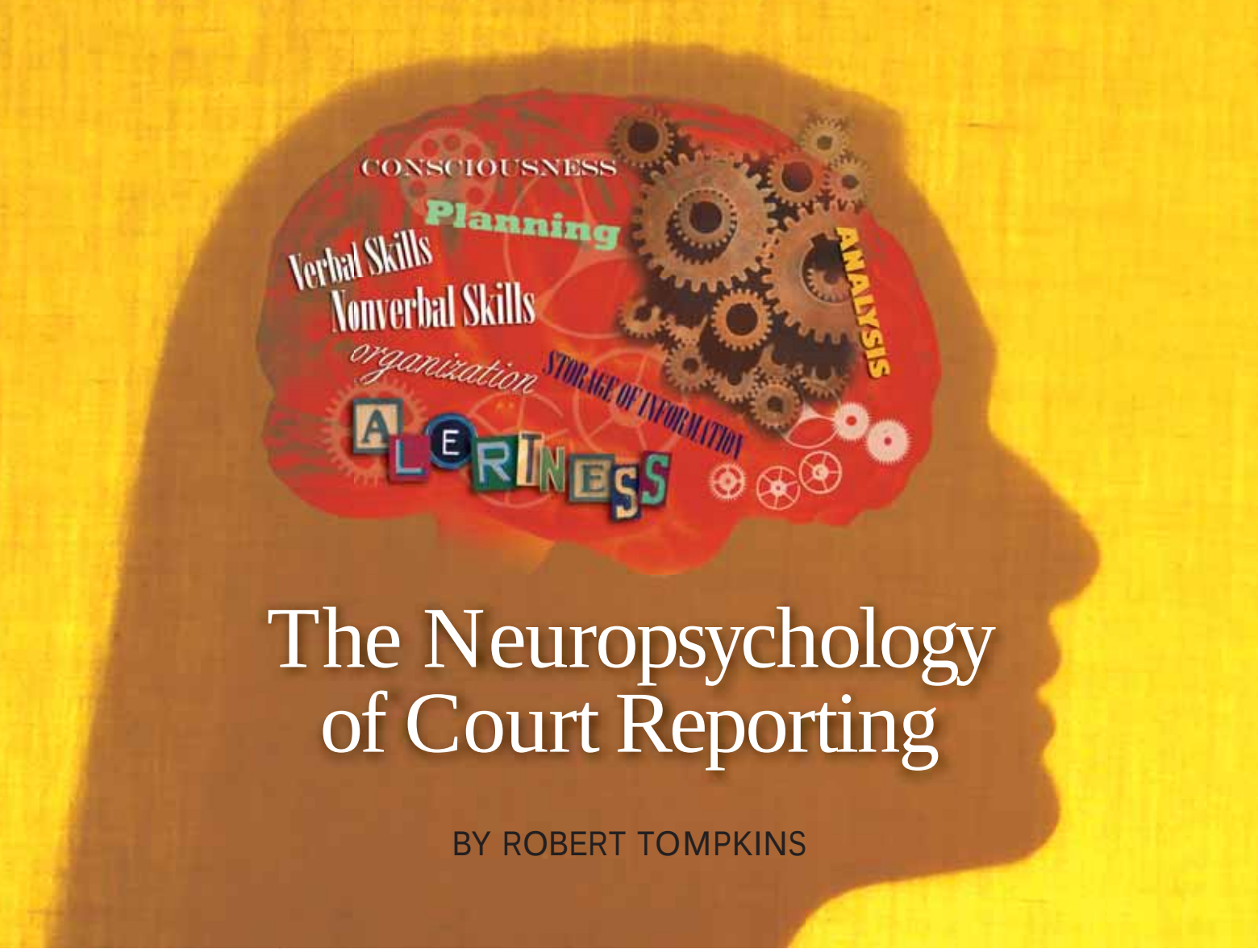

The Neuropsychology of Court Reporting

BY ROBERT TOMPKINS

You always knew that your brain was working hard. Here is a scientific discussion of the brain of a court reporter.

Court reporters perform a function that illustrates the extreme complexity of the human brain. The human brain is truly a miracle that we take for granted in daily functioning, and, with a court reporter, the level of complexity is obviously extreme. The functions necessary for such a task are multifaceted. The person must receive, comprehend, synthesize, and translate information instantaneously through a network of complicated brain mechanisms.

This is all done seemingly effortlessly, but when examining the skills necessary, the data argues for the great value of court reporters. This examination of the brain mechanisms also provides a more exact determination of the skills necessary, only capable by the amazing human brain.

To better understand what is involved, following is a brief description of the major brain functions as now understood, necessary for not only many daily human tasks, but especially for the high-level functioning involved in court reporting.

Overview of the Brain

The brain is currently understood as involving systems rather than only specific areas. The major systems and their general role in cognitive functions are still being investigated; however, the general networks are now accepted as the basis of

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the functioning brain. Ongoing research into the finer points deepens our understanding and provides new insights into the most complicated organ on the planet.

We know these areas of function from early clinicians and researchers but also from new technology such as PET and SPECT scans, as well as from neuropsychological assessment and research.

Cognitive skills involve "domains" that include overall global functions such as intelligence. Intelligence is broken down into two major cognitive domains of verbal and nonverbal. More than educational skills, intelligence is thought of as fluid thinking ability.

In addition, specific functions include memory, executive, speech and language, motor and psychomotor (fine motor dexterity, for example), attention, conceptual/reasoning, and sensory skills.

Today we realize that there are specific areas of the brain that are responsible for specific skills such as speech. The current thinking involves not only understanding the functions of specific areas of the brain but the major networks.

When performing a highly complex skill such as court reporting, we are referencing the executive functions. The executive skills involve the anterior or frontal networks. These skills include planning, organization, self-structure, regulation of behavior, and verification for both verbal and nonverbal behavior. The executive skills are dependent on intact structures of other functional systems or units in order to function. As we will see, these systems are built upon each other in a vertical manner.

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Functional Units of the Brain

A.R. Luria, a professor of psychology at the University of Moscow, hypothesized three basic functional units involving both verbal and nonverbal skills.[1] His work was based on extensive research into the specific and general systems identified. The brain is also divided into right and left hemispheres connected by the corpus callosum, the connecting structures that allow the two hemispheres to communicate. Women appear to have a richer and more developed corpus callosum. Within the second and third functional units, there are primary, secondary, and tertiary zones that will be briefly elaborated.

Functional Unit 1

This unit has the sole responsibility for consciousness and alertness, cortical tone, waking, and selective attention, which involves the law of strength. This is a part of the brain that is basic for survival.

The law of strength is a concept first proposed by Pavlov. The principle essentially states that strong stimuli evoke a strong response and weak stimuli, a weak response. In Attention Deficit Hyperactivity Disorder, for example, we see this process disturbed. Usually because of subtle brain dysfunction, the law of strength is disorganized. Selective attention is usually disturbed with either hypo- or hyperactive activity. Persons with this disorder tend to habitually attend to irrelevant information. This system involves the ascending and descending tracts in the brain. The ascending tracts carry information to the higher centers and the descending tracts carry impulses to the lower centers of the brain which involves a number of functions, but one very important function is a regulatory influence of the cortex or higher brain on the lower centers as well as recruiting energy from the lower brain.

Functional Unit 2

The second functional unit involves reception, analysis, and storage of information, both verbal and nonverbal.

The primary or projection zones facilitate reception and analysis at the basic or elementary level. This zone includes the occipital cortex (the surface and posterior gray matter), the temporal cortex necessary for discrimination of sounds and recall of sounds (the area on the lateral side behind the frontal brain), and the parietal cortex, which is necessary for sensory functions especially from motor sources (behind the temporal lobe).

The occipital cortex (surface) is an area of the brain responsible for visual recognition and discrimination of differences in subtle visual input such as letters or numbers.

The temporal cortex allows differentiation of and analysis of combinations of sounds, rhythmic recognition, spelling, and comprehension of speech and nonverbal cues. Damage to these zones usually results in spelling problems, poor retention of acoustic information, and decreased conceptual functions, including the ability to understand language and nonverbal cues. From birth, most persons have neurons or nerve cells in this region that are specifically sensitive to sound.

The secondary frontal region, or the premotor cortex, is responsible for complex, purposeful, and skilled movement. Motor skills are smoothed with normal brain function in this area with the assistance of the cerebellum. Speech is dependent on the left frontal region. Certain types of expressive aphasias occur with problems in this area of the brain. Damage to this area often leads to a deficit in speaking fluently. This is thought to be due to an inability to switch from one sound to another flexibly.

Secondary zones are associative in nature. They receive information from the primary zones and facilitate analysis, storage, and synthesis of sensation from various parts of the body.

The tertiary zones are the overlapping regions that allow the various regions to communicate rapidly and effectively. They

are zones that overlap various sensory modalities and lead to complex mental activity. Simultaneous synthesis or symbolic and elementary information involving memory and organized patterns are involved at this level.

Functional Unit 3

The third functional unit involves the anterior or frontal regions of the brain responsible for planning, organization, and verification of both verbal and nonverbal information received from the other functional units. This is the most recent evolutionary part of the brain in humans, allowing for more complex behavior.

The primary zones involve the motor strip or centers at the cortical or surface level. This region assists with complex synthesis of impulses into movement and organization of motor output.

The secondary frontal zone involves the premotor cortex that is necessary for complex intentional movement. Writing difficulties are noted with damage to this area.

The tertiary region or the frontal region is necessary for motor and premotor output. Voluntary motor behavior, involving motor functions of the extremities or with motor speech, is dependent on this area of the brain. Intention, regulation, and verification of directed behavior involving planning are dependent on this area. There are strong associations with the speech centers with this tertiary region. Importantly, high-level attention is seen due to inhibition of excitation of irrelevant information. Complex organization is subserved by this area of the brain as well. Complex sequencing of information is processed in this region as well.

The frontal region of the brain is necessary for the third functional unit to exist. It is critical for any complex multifaceted functioning at a high level and certainly is involved with court reporting. The ability to sequence or automatically synthesize sound and motor skills is dependent on this zone. New learning is difficult if there are weaknesses in this area, because the individual is not able to verify and automatically make alterations.

Court Reporting Processes

As is apparent, the brain is extremely complex and works together in larger systems or networks, while certain areas of the brain are responsible for specific skills. For very high-level information processing such as court reporting, the individual must have extremely high functions in all of the aforementioned regions.

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First, the individual must have the Functional Unit 1 operating well in order to differentiate irrelevant from relevant information and be able to differentiate sounds.

Second, sound is detected by the temporal lobe on the left and recalled long enough to be stored and quickly transferred to the association areas for comprehension and meaning of the combinations of sound. This information is then sent to the visual centers of the brain for integrating sounds and symbols, long ago blended into units of sounds and visual symbols to make words. In the learning stages in childhood, there is a visual component involved as well. For example, a child recognizes a chair visually, later learns the sounds for the word "chair," then automatically can speak about a chair without conscious awareness of the visual component, using speech to communicate. We use gestures to augment this visual component.

Once the information is decoded or understood, it is then sent to the frontal networks for motor output. In the case of a court reporter, a very rapid fine motor output is necessary for information already heard, comprehended, and processed.

In summary, the sounds have to be processed by the temporal lobe, retained long enough to be encoded or stored, then sent to the association areas for understanding, then sent to the occipital lobe for the already learned sound blending into words, and then sent to the cerebellum, which helps to integrate and smooth the process. The information is then sent to the motor area for output and is simultaneously verified by the frontal network for accuracy. Changes are made instantaneously, all the while sequencing with new information to be input and processed. This process involves complex attention referred to as divided attention and working memory. Divided attention involves performing one task while holding another competing piece of information in memory. In the case of a court reporter, dealing with already spoken information and simultaneously processing the immediate incoming information is synthesized automatically.

With realtime reporting, the complexity is increased. The reporter must possess the immediate ability to process not only at the level described but with an extremely high level of sophistication, have superior language skills in a number of subject areas, and automatic sequential skills. Interspersed in this complex network is the ability in language to make subtle differentiations of the complex English language.

Court reporting involves extremely well-developed cognitive flexibility, sequencing, and multifaceted processing of language, sensory integration, and motor skills at a high level of sophistication. While technology makes the delivery of information possible, the most important feature in the process is the highly functional system represented by all three functioning units interdependent in the amazing human brain. ■

[1]Luria, A.R. (1973). *The Working Brain: An Introduction to Neuropsychology.*